Unit 3 · Genetics

WORKSHEET

Full marks 47

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 47

1 Key words [4]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

anticodon **antiparallel** **dihybrid** **hemizygous** **N-glycosidic** **nucleoside** **peptide** **phosphodiester** **purines** **test**

A cross between two pure parents that differ in two pairs of contrasting characters is a _____ cross. A cross with a parent recessive for the genes being studied is a _____ cross. The bases adenine and guanine, with two rings each, are _____. A phosphate joined to two sugars makes a _____ bond, and a base joins the sugar's 1′ carbon by an _____ bond. The two strands of DNA, running in opposite directions, are _____. Three bases of tRNA that pair with a codon are its _____. A man has only one copy of each X-linked gene, so he is _____ for it.

2 Complete the checkerboard [3]

The checkerboard shows the F_2 of a dihybrid cross. Write the genotype in each of the six boxes marked 1 to 6. Each carries 0.5 mark.

Gametes	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	1.
Ry	RRYy	2.	RrYy	Rryy
rY	3.	RrYy	rrYY	4.
ry	RrYy	5.	rrYy	6.

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. How many different genotypes appear in the F_2 of a dihybrid cross? [1]

a. 4 **b.** 9
c. 16 **d.** 3

ii. Which of these is a pyrimidine? [1]

a. adenine **b.** guanine
c. cytosine **d.** all of these

iii. The RNA that carries amino acids to the ribosome is: [1]

a. mRNA **b.** tRNA
c. rRNA **d.** all three

iv. A color-blind man marries a woman who is not a carrier. Their daughters will be: [1]

a. all color-blind
b. all carriers with normal vision
c. half color-blind, half normal
d. all normal, not carriers

v. Genes found on the part of the Y chromosome that has no partner on the X are called: [1]

a. X-linked genes
b. holandric genes
c. pseudoautosomal genes
d. autosomal genes

4 Very short answers [4]

Write very short answers to the following questions.

a. State the phenotypic ratio of the offspring of the test cross RrYy × rryy. [1]

b. How many hydrogen bonds join guanine to cytosine? [1]

c. Which base takes the place of thymine in RNA? [1]

d. Why can a father not pass an X-linked character to his son? [1]

5 Short answers [10]

Write short answers to the following questions.

a. New combinations of characters appear in the F_2 of a dihybrid cross. [2]

b. DNA replication is called semi-conservative. [2]

c. Color blindness and hemophilia are far commoner in men than in women. **[2]**

d. Write any two differences between DNA and RNA. **[2]**

e. Write the function of mRNA and of rRNA. **[2]**

6 Long answers **[8]**

Write long answers to the following questions.

a. Describe the structure of DNA according to Watson and Crick, with a labeled diagram. **[4]**

b. What is sex-linked inheritance? Classify sex-linked genes on the basis of their location, with an example of each. **[4]**

7 Numerical problems [10]

Solve the following problems. Show your working.

a. In the F_2 of a dihybrid cross between pure tall pea plants with purple flowers (TTPP) and pure dwarf plants with white flowers (ttpp), 800 plants were raised. How many are expected to be a. tall with white flowers, b. dwarf with white flowers, c. pure for both characters? [3]

Answer: _____

b. A DNA molecule is 6.8 μm long. How many base pairs and how many complete turns does it have? [2]

Answer: _____

c. A stretch of DNA has 500 base pairs and 1,300 hydrogen bonds between its strands. How many A–T pairs and how many G–C pairs does it have? [2]

Answer: _____

d. A woman with normal vision, whose father was color-blind, marries a color-blind man. a. What are the genotypes of the woman and the man? b. What fraction of their sons, and of their daughters, are expected to be color-blind? [3]

Answer: _____

8 Think [3]

A pea plant with round yellow seeds is test-crossed and gives 52 round yellow and 49 round green seeds. What is its genotype? Show why.

9 Activity: Mendel's dihybrid cross with beans (Practical 7) (not marked)

Make gametes from four cups as in Practical 7 until you have 64 offspring, and fill in the table.

Phenotype	Tally	Your count	Expected out of 64
Round yellow			
Round green			
Wrinkled yellow			
Wrinkled green			